

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference B14552.3 PM	<div style="display: flex; justify-content: space-between;"> <div> FOR FURTHER ACTION </div> <div> See Form PCT/PEA/416 </div> </div>	
International application No. PCT/EP2004/053261	International filing date (day/month/year) 03.12.2004	Priority date (day/month/year) 04.12.2003
International Patent Classification (IPC) or national classification and IPC G01N15/14, G21K1/00, G02B6/24, B07C5/04, G02B6/12		
Applicant COMMISSARIAT A L'ENERGIE ATOMIQUE et al.		
<ol style="list-style-type: none"> 1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 7 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 3 sheets, as follows: <div style="margin-left: 20px;"> <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. </div> b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions). 		
<ol style="list-style-type: none"> 4. This report contains indications relating to the following items: <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I Basis of the opinion <input type="checkbox"/> Box No. II Priority <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application </div> 		
Date of submission of the demand 20.08.2005	Date of completion of this report 14.10.2005	
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized Officer Bravin, M Telephone No. +49 89 2399-2417	

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AP3 Rec'd PCT/PTO 02 JUN 2005
International application No.
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Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-15 as originally filed

Claims, Numbers

1-15 received on 20.08.2005 with letter of 16.08.2005

Drawings, Sheets

1/7-7/7 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-15
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-15
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

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Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1.

Reference is made to the following documents:

- D1: TANAKA T ET AL: "Optically induced propulsion of small particles in an evenescent field of higher propagation mode in a multimode, channeled waveguide", APPLIED PHYSICS LETTERS, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 77, no. 20, 13 November 2000 (2000-11-13), pages 3131-3133, XP000970277 ISSN: 0003-6951
- D2: EP-A-1 324 645 (COMMISSARIAT ENERGIE ATOMIQUE) 2 July 2003 (2003-07-02)
- D3: KAWATA S; TANI T: "Optically driven Mie particles in an evanescent field along a channeled waveguide" OPTICS LETTERS, vol. 21, no. 21, 1 November 1996 (1996-11-01), pages 1768-1770, XP002287992
- D4: NG L N ET AL: "Propulsion of gold nanoparticles on optical waveguides" OPTICS COMMUNICATIONS, NORTH-HOLLAND PUBLISHING CO. AMSTERDAM, NL, vol. 208, no. 1-3, 1 July 2002 (2002-07-01), pages 117-124, XP004369118 ISSN: 0030-4018

2.

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1 and 12 does not involve an inventive step in the sense of Article 33(3) PCT.

2.1

Claim 1

The document D3 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses the idea of separating particles according to size using a technique where particles immersed in a liquid are driven along a waveguide by radiation introduced in the waveguide (see p. 1770, col. 2, lines 26-35, D3).

Claim 1 differs from D3 in that it defines the use of a waveguide coupled to a second guide in a coupling area, the radiation entraining all particles towards the coupling area, the particles being separated as they pass the coupling area.

The problem solved can be seen as defining a practical implementation of the size separation suggested in D3.

The use of waveguide structures according to claim 1 for sorting optically-driven particles is taught in document D2 (see [0001]-[0003], [0012]-[0013], [0020] and Figs. 6-7, D2). It would therefore be obvious to the skilled person to use such structures according to D2 for solving the aforementioned problem, thereby arriving at the subject matter of claim 1 without an inventive step being involved.

2.2

Claim 12

Document D2 discloses a particle separation device (see [0007]-[0008] and Fig. 6, D2) comprising two optical guides (e.g. 9 and 10, Fig. 6, D2) coupled by a coupling area (intersection).

Claim 12 differs from D1 in that it defines respective dimension ranges for the coupling area and the distance between the guides.

Such dimensions constitute however obvious selections in the present context as they would be arrived at in the device of Fig. 6, D2, should the skilled person take the width of the waveguides on Fig. 6, D2 between 4.0 and 11.0 micrometers as taught in D1 with respect to a similar particle propulsing apparatus (see p. 3131, col. 1, last paragraph, D1). In particular, the distance between the guides (9, 10, Fig. 6, D2), starting from zero at their intersection, would span the range defined in claim 12 as the guides separate from each other.

The subject matter of claim 12 therefore lacks an inventive step (Art. 33(3) PCT).

3.

Dependent claims 2-11 and 13-15 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step (Art. 33(3) PCT), these claims defining known or obvious features in the context of particle propulsion on optical waveguides, see documents D1-D4 and the corresponding passages mentioned in the International search report.

Re Item VIII

Certain observations on the international application

1.

Claims 1 and 12 lack consistency since independent claim 12 does not define means for introducing radiation in a waveguide. Claim 12 thus does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

2.

According to the description on page 6, lines 3-13, particles are driven by an evanescent field by injecting light in similar conditions as disclosed on Fig. 1, D1, and no alternative embodiment is described. Since claim 1 can be interpreted in terms of the (different) experimental conditions according to D2, the scope of the claim clearly extends beyond what is allowed by the description and drawings. Claim 1 is thus not supported by the description, as required by Art. 6 PCT.

3.

In this respect also, it is to be noted that claim 1 does not precisely define how the separation is to be performed as the particles pass into the coupling area. As such, considering the relevant comments in document D2 given in col. 1, paragraph [0005], D2 (in particular [0005], lines 12-17, D2), the requirements of clarity set by Article 6 PCT are not met. Indeed, claim 1 can be viewed as defining the subject-matter in terms of the result to be achieved - which merely amounts to a statement of the underlying problem (i.e. how to switch between different channels) - without providing the technical features necessary for

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achieving this result.